Artificial intelligence

- The impact of artificial intelligence on the adenoma detection rate : Comparison between experienced, intermediate and trainee endoscopists' adenoma detection rate
- Identifying patients with mild cognitive impairment at high risk of transitioning to Alzheimer's disease using routinely collected data
- Implementation of artificial intelligence (AI) in healthcare: historical development, current technologies and challenges
- AI-enabled clinical decision support systems: challenges and opportunities
- Leveraging retrieval-augmented large language models for patient education in ophthalmology
- Artificial Intelligence to Support Qualitative Data Analysis: Promises, Approaches, Pitfalls
- Leveraging Artificial Intelligence for Advancements in Liquid Dosage Formulations in the Pharmaceutical Industry
- 3D Magnetic resonance image denoising using nonlocal and nonconvex tensor train regularization

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Artificial intelligence is the branch of computer science dealing with the simulation of intelligent behavior in computers [1] [2] [3].

Artificial intelligence (AI) refers to the simulation of human intelligence in machines, enabling them to perform tasks that typically require human cognitive abilities. These tasks include learning, reasoning, problem-solving, perception, language understanding, and decision-making. AI systems can be rule-based (symbolic AI) or use machine learning, including deep learning, to improve performance through experience. AI is applied in various fields such as healthcare, finance, robotics, and natural language processing.

The modern medical world is transitioning towards artificial intelligence [4]

Artificial intelligence (AI) has not only revolutionized cybersecurity, the Internet of Things, online shopping, product and process optimization, and decision-making for large companies but has also revitalized the educational and research fields.

Research tends to be overwhelming and, to some extent, tedious due to the significant amount of time invested in the processes involved. However, it's not all bad news, as AI has led to the development of tools that can accelerate these processes, resulting in time savings and resource optimization.

Types

Generative Artificial Intelligence

Artificial Intelligence (AI) can be classified into different types based on various factors, such as its capabilities, functionality, or the level of intelligence it exhibits. Here's an overview of the main types of AI:

1. **Based on Capabilities**

Narrow AI (Weak AI) - **Definition**: This type of AI is designed and trained to perform a specific task. It is "narrow" in its focus and does not possess general intelligence. - **Example**: Virtual assistants like Siri and Alexa, facial recognition software, and recommendation systems on streaming platforms. - **Key Features**: Limited to specific tasks, cannot adapt outside of its trained domain.

General AI (Strong AI) - **Definition**: This form of AI, also known as Artificial General Intelligence (AGI), would possess the ability to perform any intellectual task that a human can do. It would have the capacity for reasoning, problem-solving, learning, and understanding in multiple domains. - **Example**: A theoretical AI system that can learn and think across diverse topics as well as adapt to new, unforeseen tasks. - **Key Features**: Aims to have human-like cognitive abilities and can perform a wide variety of tasks with versatility.

Superintelligent AI - **Definition**: This is a level of AI that surpasses human intelligence across all aspects—creativity, problem-solving, emotional intelligence, and more. - **Example**: Hypothetical AI that can outperform the best human minds in every field, including scientific research, art, and social interactions. - **Key Features**: Beyond human-level intelligence, capable of outperforming humans in all areas of cognition.

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2. **Based on Functionality**

Reactive Machines - **Definition**: These AI systems are designed to respond to specific inputs with pre-programmed outputs. They do not store past experiences or learn from them. - **Example**: IBM's Deep Blue chess-playing computer, which could evaluate a limited number of moves but didn't learn from previous games. - **Key Features**: No memory, responds only to current stimuli.

Limited Memory - **Definition**: These systems can learn from historical data and adjust their responses based on that learning. While they do have some level of memory, they are still restricted in their learning abilities. - **Example**: Self-driving cars that learn from past driving experiences to improve performance. - **Key Features**: Uses past data to inform future decisions, but doesn't retain a long-term memory or evolve beyond its initial programming.

Theory of Mind - **Definition**: This type of AI aims to replicate human-like understanding, such as recognizing and responding to emotions, beliefs, desires, and intentions. - **Example**: AI robots or systems that could, in the future, recognize and simulate human mental states for improved social interactions. - **Key Features**: Could understand the mental states of others and adjust its behavior accordingly, enhancing human-computer interactions.

Self-aware AI - **Definition**: These AI systems would be conscious of their own existence and have a sense of self. They would possess their own goals, desires, and awareness of their environment. - **Example**: A hypothetical future AI that has its own identity and can reflect on its actions and purpose. - **Key Features**: Self-awareness, consciousness, and independent thought. This is purely theoretical at present.

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3. **Based on Techniques and Approaches**

Symbolic AI (Good Old-Fashioned AI - GOFAI) - **Definition**: This approach involves explicitly programming AI to follow rules and logic to perform tasks, often represented in symbols. - **Example**: Expert systems or rule-based systems, where the AI follows predefined rules to make decisions. - **Key Features**: Logic-based, interpretable, and rule-driven.

Machine Learning (ML) - **Definition**: ML allows systems to learn from data without being explicitly programmed. It uses statistical methods to find patterns and improve decision-making over time. - **Example**: Image recognition, natural language processing, and fraud detection. - **Key Features**: Learns from data, improves with experience, includes techniques such as supervised learning, unsupervised learning, and reinforcement learning.

Deep Learning - **Definition**: A subset of machine learning that uses neural networks with many layers (deep neural networks) to process vast amounts of data and learn from it. - **Example**: Image and speech recognition, autonomous vehicles, and AI-driven medical diagnosis. - **Key Features**: Uses large neural networks, excels in handling unstructured data (images, audio, etc.).

Natural Language Processing (NLP) - **Definition**: This field of AI focuses on enabling machines to understand and generate human language. - **Example**: Chatbots, language translation tools, and sentiment analysis. - **Key Features**: Deals with text and speech, aims for natural, human-like interactions.

Computer Vision - **Definition**: AI that enables machines to interpret and understand visual data from the world, such as images or video. - **Example**: Face recognition software, self-driving cars, and medical imaging analysis. - **Key Features**: Analyzes and understands images or video content, often using deep learning techniques.

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These categories provide a framework for understanding the different types and capabilities of AI. While we've made great strides with narrow AI, the development of general and superintelligent AI remains a subject of ongoing research and debate.

Summary of five AI tools specialized in research

Branches

Artificial intelligence (AI) is a vast field with numerous branches, each focusing on specific aspects of intelligent behavior and its applications. Here are some major branches of AI:

1. **Machine Learning (ML)**

1. **Description:** Focuses on building systems that can learn and improve from data without being explicitly programmed.
2. **Applications:** Predictive analytics, recommendation systems, fraud detection.
3. **Subfields:**

1. Supervised Learning
2. Unsupervised Learning
3. Reinforcement Learning
4. Semi-Supervised Learning

2. **Deep Learning**

1. **Description:** A subset of machine learning that uses neural networks with multiple layers (deep neural networks) to model complex patterns.
2. **Applications:** Image and speech recognition, natural language processing, autonomous vehicles.

3. **Natural Language Processing (NLP)**

1. **Description:** Enables machines to understand, interpret, and generate human language.
2. **Applications:** Chatbots, translation tools, sentiment analysis, text summarization.

4. **Computer Vision**

1. **Description:** Focuses on enabling machines to interpret and analyze visual data from the world.
2. **Applications:** Facial recognition, object detection, medical imaging, self-driving cars.

5. **Robotics**

1. **Description:** Deals with designing and programming robots to perform tasks in the physical world.
2. **Applications:** Industrial automation, healthcare robots, exploration in extreme environments.

6. **Expert Systems**

1. **Description:** Uses knowledge bases and inference rules to mimic the decision-making ability of a human expert.
2. **Applications:** Medical diagnosis, troubleshooting systems, financial decision-making.

7. **Fuzzy Logic**

1. **Description:** Handles reasoning and decision-making under uncertainty by mimicking human-like thinking.
2. **Applications:** Control systems (e.g., washing machines, air conditioners), decision support systems.

8. **Neural Networks**

1. **Description:** Modeled after the human brain, neural networks are algorithms designed to recognize patterns.
2. **Applications:** Handwriting recognition, stock market predictions, autonomous systems.

9. **Evolutionary Computation**

1. **Description:** Uses mechanisms inspired by biological evolution, such as mutation, selection, and crossover.
2. **Applications:** Optimization problems, game strategies, genetic algorithms.

10. **Reinforcement Learning**

1. **Description:** Focuses on training agents to make sequences of decisions by rewarding desired actions.
2. **Applications:** Game AI, robotics, traffic control systems.

11. **Speech Recognition**

1. **Description:** Converts spoken language into text.
2. **Applications:** Virtual assistants, voice-controlled devices.

12. **Planning and Scheduling**

1. **Description:** Develops methods for devising strategies or action sequences to achieve goals.
2. **Applications:** Logistics, space exploration, robotics.

13. **Swarm Intelligence**

1. **Description:** Inspired by the collective behavior of social systems like ant colonies or bird flocks.
2. **Applications:** Optimization, routing, and resource allocation.

14. **Artificial General Intelligence (AGI)**

1. **Description:** Refers to the theoretical development of machines that can perform any intellectual task a human can.
2. **Status:** Still in research and development.

15. **Cognitive Computing**

1. **Description:** Mimics human thought processes in a computerized model.
2. **Applications:** Virtual assistants, sentiment analysis, decision-making tools.

16. **AI Ethics and Governance**

1. **Description:** Focuses on the ethical use, societal impact, and governance of AI technologies.
2. **Applications:** Bias detection, accountability frameworks, policy-making.

see Ethics in Artificial Intelligence

Rayyan

Rayyan

Consensus

Consensus is an AI-powered search engine designed to find information in research articles. In other words, it's like Google for researchers.

The most important features include:

Search results and articles can be saved into lists, either predetermined (My Favorites) or custom-made with personalized titles. Integration with Zotero (soon with Mendeley, Paperpile, and EndNote). Its GPT-4-powered scientific summaries provide a brief summary of the most relevant information to answer your question (via the Summary option at the top of the interface). The interface includes filters for personalized searches. It integrates a plugin with GPT-4.

Research Rabbit

[Research Rabbit](#)

SciSpace

[SciSpace](#)

Scite

[Scite](#)

Assistant

Features a new function to customize the length of responses using the GPT-3.5 model. Offers more styles for creating bibliographic references. There is no doubt that AI applications are here to stay, constantly improving to modernize and enrich the research processes of investigators, teachers, and students. However, it is essential to remember that these AI applications should be used as tools rather than as replacements for cognitive processes, critical thinking, or human reasoning.

Subfields

[Machine Learning](#): Machine learning is a subfield of AI that focuses on the development of algorithms and models that enable computers to learn from and make predictions or decisions based on data. It includes supervised learning, unsupervised learning, reinforcement learning, and deep learning.

[Deep Learning](#): Deep learning is a subset of machine learning that employs artificial neural networks with many layers (deep neural networks). It has shown remarkable success in tasks such as image and speech recognition, natural language processing, and generative modeling.

[Natural Language Processing](#) (NLP): NLP is concerned with enabling computers to understand, interpret, and generate human language. It has applications in chatbots, language translation, sentiment analysis, and text generation.

[Computer Vision](#): Computer vision focuses on teaching machines to interpret and understand visual information from images and videos. This subfield is crucial for tasks like image recognition, object

detection, and autonomous vehicles.

Reinforcement Learning: Reinforcement learning is a type of machine learning where agents learn to make sequences of decisions by interacting with an environment. It is commonly used in autonomous robotics, game playing, and decision-making tasks.

Robotics: Robotics combines AI with mechanical and electrical engineering to create machines and robots that can perform physical tasks autonomously or semi-autonomously. It has applications in manufacturing, healthcare, and exploration.

Expert Systems: Expert systems are computer programs designed to emulate the decision-making abilities of a human expert in a specific domain. They use a knowledge base and inference engine to provide advice or solve problems.

Knowledge Representation and Reasoning: This subfield focuses on how to represent information and knowledge in a form that is understandable and usable by AI systems. It deals with formal logic, ontologies, and semantic networks.

Cognitive Computing: Cognitive computing aims to create AI systems that mimic human cognitive functions, including perception, learning, reasoning, and problem-solving. These systems often work with unstructured data.

Speech Recognition and Synthesis: These subfields focus on the conversion of spoken language into text and vice versa. Applications include virtual assistants, transcription services, and accessibility features.

Machine Vision: Machine vision is the use of computer vision techniques in industrial and manufacturing settings to automate visual inspection and quality control processes.

AI Ethics and Fairness: This subfield deals with the ethical and societal implications of AI technologies, including issues of bias, transparency, accountability, and the responsible development and deployment of AI systems.

AI for Healthcare: AI is increasingly being used in healthcare for tasks such as medical image analysis, disease diagnosis, drug discovery, and predictive analytics.

AI in Finance: AI is applied in finance for tasks like algorithmic trading, risk assessment, fraud detection, and portfolio management.

AI in Education: AI is used in educational technology to create personalized learning experiences, adaptive assessment, and intelligent tutoring systems.

AI in Gaming: AI is used to create non-player characters (NPCs) that exhibit human-like behaviors and strategies in video games.

AI in Natural Resource Management: AI is applied in environmental sciences to optimize resource allocation, monitor ecosystems, and manage resources sustainably.

These subfields often overlap and interact, and advancements in one area can benefit others. The field of artificial intelligence continues to evolve, with ongoing research, development, and applications in various domains.

Artificial intelligence (AI) has advanced substantially in recent years, transforming many industries and improving the way people live and work. It is entering the realm of medicine at an increasing pace and has been tested in a variety of clinical applications ranging from diagnosis to outcome prediction [5] [6].

In scientific research, AI can enhance the quality and efficiency of data analysis and publication. However, AI has also opened up the possibility of generating high-quality fraudulent papers that are difficult to detect, raising important questions about the integrity of scientific research and the trustworthiness of published papers.

Artificial intelligence in Neurosurgery

see Artificial intelligence in Neurosurgery.

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